[preprint,showpacs,amsmath,amssymb,pra]revtex4

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Multi-Channel Inverse Scattering Problem on the Line: Thresholds and Bound States

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abstract We consider the multi-channel inverse scattering problem in one-dimension in the presence of thresholds and bound states for a potential of finite support. Utilizing the Levin representation, we derive the general Marchenko integral equation for N-coupled channels and show that, unlike to the case of the radial inverse scattering problem, the information on the bound state energies and asymptotic normalization constants can be inferred from the reflection coefficient matrix alone. Thus, given this matrix, the Marchenko inverse scattering procedure can provide us with a unique multi-channel potential. The relationship to supersymmetric partner potentials as well as possible applications are discussed. The integral equation has been implemented numerically and applied to several schematic examples showing the characteristic features of multi-channel systems. A possible application of the formalism to technological problems is briefly discussed.

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